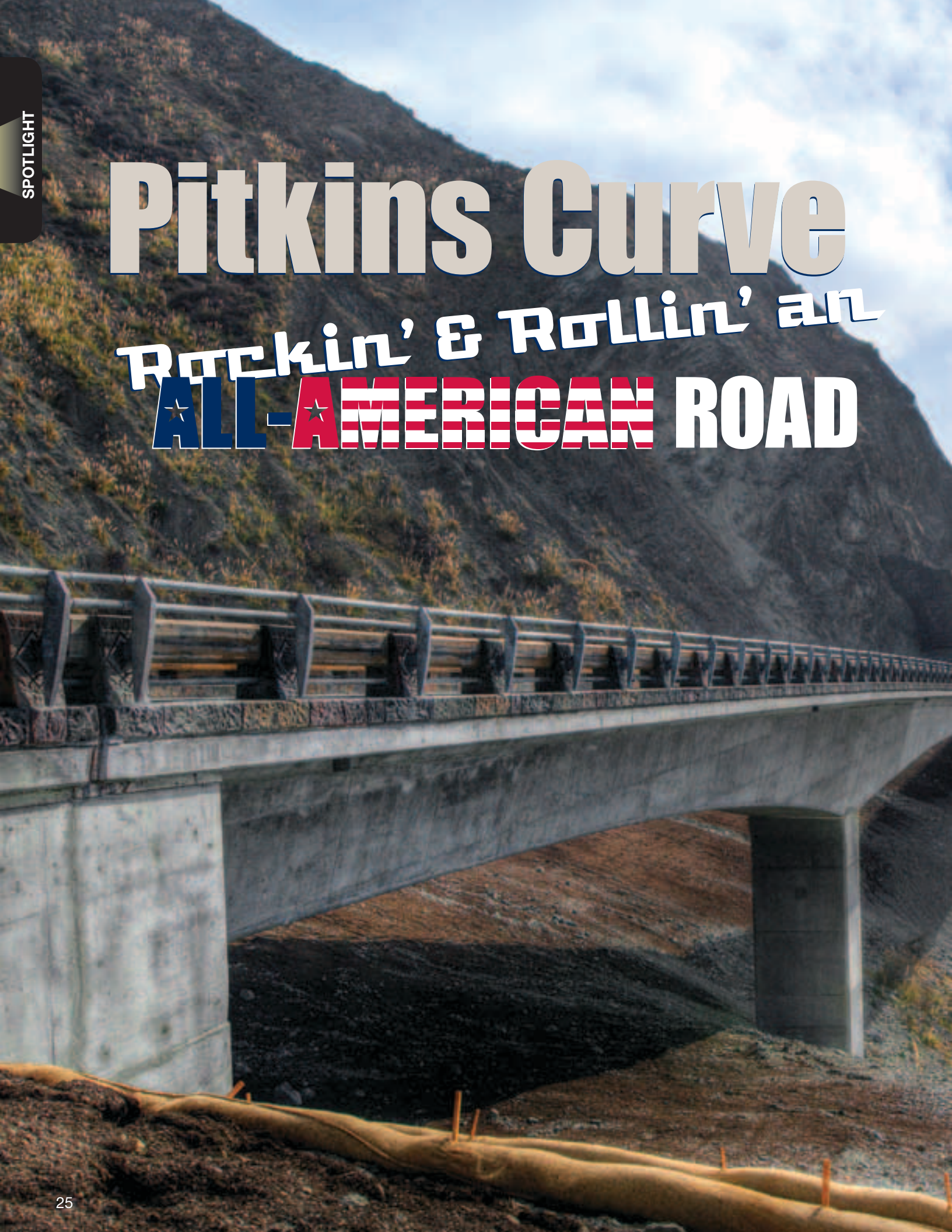
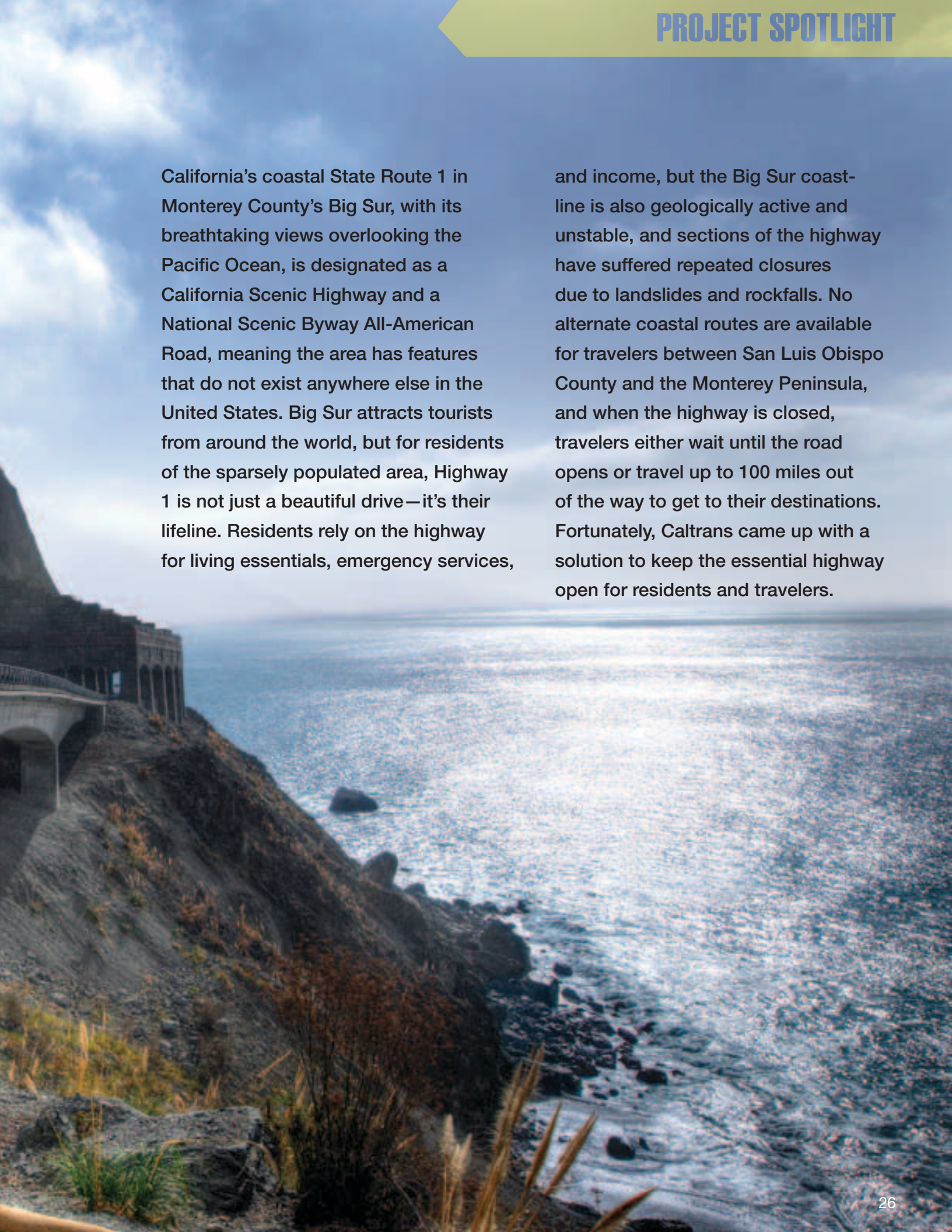
Pitkins Curve

Rockin' & Rollin' an ALL-AMERICAN ROAD



California's coastal State Route 1 in Monterey County's Big Sur, with its breathtaking views overlooking the Pacific Ocean, is designated as a California Scenic Highway and a National Scenic Byway All-American Road, meaning the area has features that do not exist anywhere else in the United States. Big Sur attracts tourists from around the world, but for residents of the sparsely populated area, Highway 1 is not just a beautiful drive—it's their lifeline. Residents rely on the highway for living essentials, emergency services, and income, but the Big Sur coastline is also geologically active and unstable, and sections of the highway have suffered repeated closures due to landslides and rockfalls. No alternate coastal routes are available for travelers between San Luis Obispo County and the Monterey Peninsula, and when the highway is closed, travelers either wait until the road opens or travel up to 100 miles out of the way to get to their destinations. Fortunately, Caltrans came up with a solution to keep the essential highway open for residents and travelers.



Highway 1 Pitkins Curve and Rain Rocks

The Big Sur stretch of Highway 1 traverses the steepest coastal slope in the contiguous United States and is one of the toughest highway maintenance challenges on California's central coast. The short distance north of Limekiln Creek and south of Lucia on State Route 1 has two areas of significant roadway instability: "Pitkins Curve" and "Rain Rocks." Over the years, extensive landslides and rockfalls repeatedly reduced or severed travel on the highway, sometimes for months at a time, and profoundly affected local and regional economies.

From the time Highway 1 was completed in 1937, slopes above and below it have been in a constant state of erosion. The 1998 El Niño storms caused the most damage in the Big Sur Coast highway's history. At Pitkins Curve, highway restoration cost $1 million and disrupted traffic for five months. Rocks also fell at Rain Rocks, and Caltrans covered the slope with a wire mesh rock net to ensure safety for travelers and highway workers. Installing the net cost $1 million and disrupted traffic for 20 days.

In 2000, a massive landslide below the highway at Pitkins Curve took out both lanes and required 7,000 truckloads of debris to be hauled away, costing $3.4 million and limiting travel for 60 days. Again, in 2001, a landslide above Pitkins Curve and intensified rockfall at Rain Rocks disrupted traffic for two months, requiring crews to haul away 1,400 truckloads of material at a cost of $1.5 million. Each year after, about 700 truckloads of material were transported from the site. Geologists and geotechnical engineers studied the slopes at Pitkins Curve and Rain Rocks and concluded that the hillsides would continue sliding.

Keeping an All-American Road Open

After slides or rockfalls at Pitkins Curve/Rain Rocks, Caltrans needed to make emergency repairs to reopen the highway as quickly as possible, but those repairs gave us limited options and placed workers at risk. Highway workers often work under hazardous conditions while maintaining the area, and scaling cliffs to knock down precariously situated boulders put them in the most active rockfall areas.

Clearing the road after landslides and rockfalls also had elevated costs and jeopardized environmental resources. Among the most difficult and expensive activities at Pitkins Curve/Rain Rocks was handling the large volume of rocks and soil generated by the landslides and subsequent repairs. In times past, soil was pushed into the sea, but since 1992, with the designation of the Monterey Bay National Marine Sanctuary, the practice was avoided due to potential effects to the marine environment. Soil is now trucked to inland locations 10 or more miles away. Stockpile sites are limited and diminishing, and as soil is transported farther from where it was generated, the associated monetary and environmental costs increase. Pitkins Curve/Rain Rocks averaged more than $1 million a year in maintenance, whereas other unstable Big Sur highway locations requiring regular maintenance average about $10,000 to $20,000 per year.

Rock Shed and Bridge Let Nature Run its Course

Finding a permanent solution to the frequent and costly highway closures at Pitkins Curve/Rain Rocks was a team effort. Caltrans held public meetings with stakeholders, including the Sierra Club, California Coastal Commission, local businesses, residents, and individuals from groups protecting indigenous flora and fauna. Everyone agreed that the safest, most dependable, and least expensive long-term solution was a bridge and a rock shed that allows nature to run its course and lets landslide material fall naturally into the ocean.

The Rain Rocks shed is the only roadway structure of its kind in the nation. It has a faux keystone finish, aqueduct-like arches, and a slanted roof that allows rocks to tumble into the ocean without affecting the highway or drivers. The Pitkins Curve Bridge spans over part of the ocean, allows rocks to fall under the bridge and into the water, and offers breathtaking views by bringing drivers closer to the water.

The new rock shed and bridge won the 2013 California Transportation Foundation's "Structure Project of the Year" award. The project took four years to build, cost $39 million, and increased safety by greatly reducing motorists' and workers' encounters with landslides and falling rocks by deflecting large, sometimes car-size boulders from the highway. The life span of the bridge and rock shed is conservatively estimated at 50 years. Over that period, the total cost of maintaining the highway with the new bridge and rock shed is estimated to be $1.7 million, whereas we estimate that it would cost about $112 million over the next 50 years to maintain the highway without the new structures.

The new bridge and shed allow nature to keep the rocks rolling, but instead of wreaking havoc on the lives of the people who depend on this stretch of highway, the new structures offer a unique and sustainable solution to what was once an ongoing problem.